9

# ANNUAL REPORT

OF THE

# Oregon Agricultural College

AND

# Experiment Station

FOR THE YEAR ENDING

## JUNE 30, 1897.

AGRICULTURAL COLLEGE PRINTING OFFICE.
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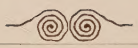
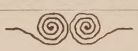


PUBLISHED BY THE STATION COUNCIL.



# ANNUAL REPORT

OF THE

# OREGON AGRICULTURAL COLLEGE

## AND EXPERIMENT STATION, 1897.

### REPORT OF THE PRESIDENT OF THE BOARD OF REGENTS.

*To His Excellency, W. P. Lord, Governor of Oregon:—*

SIR: I have the honor of respectfully submitting to you the annual report of the State Agricultural College and Experiment Station of the State of Oregon for the year ending June 30, 1897, the ninth year of this institution under the management of the Board of Regents as provided for by act of the legislative assembly approved February 18, 1885.

For eighteen years prior to July 1, 1888, this institution was known as Corvallis College, and was under the control and management of the Board of Trustees appointed by the Methodist Episcopal Church South; this report therefore covers the work done during its twenty-seventh year.

The Experimental Station provided for by the act of congress approved March 2, 1887, was established in conjunction with this college by an act of the legislative assembly of the State of Oregon approved February 25, 1889.

The attendance at this college prior to the year ending June 30, 1889, cannot be accurately stated; however, the following will show the number of students attending this institution and the number of graduates for the nine years ending June 30, 1897:

| *Year.* | *Preparatory.* | *Freshman.* | *Sophomore.* | *Junior.* | *Senior.* | *Post Grad.* | *Special.* | *Total.* | *Graduate.* |
|---|---|---|---|---|---|---|---|---|---|
| 1889 | 36 | 33 | 14 | 14 | ..... | ..... | ..... | 99 | 14 |
| 1890 | 67 | 55 | 17 | 6 | ..... | 6 | ..... | 151 | 4 |
| 1891 | 76 | 83 | 24 | 15 | ..... | 3 | ..... | 201 | 3 |
| 1892 | 86 | 63 | 28 | 19 | 9 | 3 | ..... | 208 | 15 |
| 1893 | 98 | 123 | 31 | 18 | 7 | 5 | ..... | 282 | 18 |
| 1894 | 36 | 103 | 71 | 21 | 5 | 4 | ..... | 240 | 17 |
| 1895 | 47 | 85 | 64 | 52 | 13 | ..... | ..... | 261 | 51 |
| 1896 | 80 | 175 | 63 | 54 | 9 | 14 | 2 | 397 | 43 |
| 1897 | ..... | 157 | 80 | 29 | 17 | 11 | 33 | 327 | 17 |
| Totals | 526 | 877 | 392 | 228 | 60 | 46 | 35 | 2166 | 182 |

The total number of graduates at this college prior to the year ending June 30, 1889, was 90, making the number of graduates at this college during the twenty-seven years, 272. It will be observed that during the past nine years the number of graduates has more than doubled the number graduated during the years preceding.

The Board during the past year abolished the preparatory department and thereby decreased to some extent the number of pupils enrolled; still it appears that during the last year, there were not as many pupils enrolled in the college courses by 21, as were enrolled during the preceding year. It is claimed that the change requiring a four-year course to graduate at this college instead of the three-year course previously required, will account for the large decrease in the number of graduates this year, as compared with the previous year. The average annual attendance during the past nine years equals 240⅔ pupils per annum, and clearly indicates the growing interest that our people are taking in this educational institution. The present Board have secured in fee to the State of Oregon title to 158 91-100 acres of land, upon which is situated the college buildings, a three story brick edifice, mechanical hall, chemical laboratory, girls' hall, boys' hall, creamery, greenhouse, barn and other buildings, with furniture, implements, machinery, tools etc., for the several branches of work at the college and station. This property is estimated to be reasonably worth at least $100,000.00.

By acts of the legislative assemblies of the State of Oregon, in 1889, 1891, and 1893, there was an appropriation of ninety-two thousand three hundred and nine dollars and eighty cents for the purchase of additional land, erection of buildings, the purchase of machinery, implements, expense of litigation, etc.

There was also appropriated by acts of the legislative assembly of the State of Oregon approved February 18, 1889, annually in aid of the current expenses of the State Agricultural College, and payment of professors and instructors therein $5,000.00. During the three years last past no part of this last named appropriation has been received from the State.

The expenditures of moneys by the Board, during the nine years under review when compared with like expenditures made by the other Pacific Coast States for like institutions, must be considered creditable to those charged with the management of this college and station.

The following will indicate to you the appropriations made by each of the States named at the last session of their legislative assembly for the support of their agricultural college and experiment station:

In 1897 California appropriated one cent of each one hundred dollars of the taxable property of the State, and fifteen thousand dollars additional. In that State, the agricultural college and station is managed in conjunction with the university. In 1897 Nevada appropriated one cent on every one hundred dollars taxable property for the support of the university, college and station, and made special appropriations amounting to $23,527.40. In 1897 Utah appropriated annually $10,000 for the college and station, and made a special appropriation of $12,000 for buildings. In 1897 Idaho appropriated annually for the university and agricultural college $13,500.00; also made a special appropriation of $4,469.14 for the same purpose. In 1895—the latest law at hand—Washington appropriated to the agricultural college and station, annually, $25,000.00 and a special appropriation of $51,374.62. In 1893—the last session laws of Montana accessible—there was appropriated for college and station $15,000.00 annually.

Many of the Eastern States make large annual appropriations for their agricultural colleges and experimental stations. We feel confident no State in the Union presents greater necessity for this class of work than the great and undeveloped State of Oregon; still we recognize and feel that our people are unable to endure the additional burden of taxation that would be necessarily levied against them to place this institution upon the same footing as those of the older and wealthier States. However, our people should feel a just pride in giving the necessary aid to this their educational institution, when it is taken into consideration that the general government has made liberal appropriations to the Agricultural College and Experiment Station amounting to about $50,000.00 annually. To utilize this money it is absolutely necessary that our people should contribute a sufficient amount annually to maintain the buildings and make the necessary improvements thereon from time to time as the same may be required.

It is estimated that the necessary repairs required on the buildings on the grounds at the college and station will cost at least

$5,000.00; provisions should be made to preserve and keep this valuable property intact. It is also absolutely necessary that there should be provision made for the erection of a suitable building so as to accommodate the military cadets with an armory and drill hall, with suitable rooms therein where the young men and young women attending this college can receive proper instruction in physical culture. From the report of the Secretary of Agriculture to the fifty-fourth congress, second session, dated February 18, 1897, relating to the expenditure of the experimental funds derived under the act of congress approved March 2, 1887, for the expenditure of money for the year ending June 30, 1896, there appear to be twenty-six stations that employ a greater number of persons as station staff and teachers than the number employed at this station.

There are but five of the fifty stations reported that pay out of this fund as much as our station appropriates for this purpose.

During the year the final distribution and accounting of the assignee of the insolvent bank of Hamilton, Job & Company has been made. It is found that the loss of this institution amounts to ten thousand five hundred and ten dollars and fifty-five cents. This loss is out of the funds received from the State of Oregon, as the fund for the college and station coming from the general government was made whole and accounted for in the year of the suspension of said bank.

In the biennial reports of the State officers of Oregon dated December 31, 1896, it is disclosed that there is $137,306.36 to the credit of the Agricultural College fund arising from the sale of the lands acquired under the provision of the act of congress approved July 2, 1862. It is disclosed that there has been an increase of the principal of said fund of $4,825.66 since the biennial report of December 31, 1894. All but $3,704.99 of this fund appears by said report to be bearing interest. This at eight per cent. should yield annually $10,688.10. During the past three years the amount available for the support of this college from this source has not exceeded $6,000 annually. The report of the State treasurer December 31, 1896, discloses the fact that there is about $18,000.00 interest due on the notes outstanding, reckoning the interest at eight per cent. per annum. This amount if collected under the law as it stands would become a part of the endowment fund of this college and would increase the amount

of said fund to over $155,000.00, and also increase the annual interest account $1,400.00, which should be available annually to the support of this college.

Under the terms and provisions of the act of the legislative assembly of the State of Oregon approved October 9, 1862, agreeing irrevocably to assume and comply with all the provisions and the terms of the act of congress approved July 2, 1862, the legislative assembly of the State of Oregon should make provision so that the interest accruing each year would be available for the support of the college without any diminution as required under sections 3 and 4 and subdivision one of section 5 of said act of congress.

This institution properly managed is destined to wield a great and important influence in moulding the minds of the young people who come under its control.

They should be well equipped on closing their college course at this institution to go forth in the world and exercise great influence in upbuilding all that pertains to good citizenship in this great republic.

All of which is respectfully submitted.

J. T. APPERSON,
President of the Board.

# REPORT OF THE DIRECTOR

## FOR THE YEAR ENDING JUNE 30, 1897.

*To Hon. J. T. Apperson, President of the Board of Regents of the Oregon Agricultural College and Experiment Station:—*

SIR: It is my pleasure to submit to you the annual report of the work of the Oregon Experiment Station.

The work of the Experiment Station is classified under two distinct heads; *first*, the investigations and experiments in agriculture; and, *second*, the dissemination of knowledge. The information disseminated comprises that gained by original investigation on the part of our station force, as well as that gathered from other sources, which will be valuable to the agricultural people of the State and which will especially bear upon such productions as are fitted to our climate and market conditions. These conditions are so extensively diversified that the means at our command will allow us to cover, in original work, only a limited field of investigation. We have tried during the year to concentrate our work, and the number of bulletins issued shows a concentrated effort to do the best work along lines of the most important industrial interests of the State.

The work of the station is embraced in the following departments:—

Agriculture (including dairying).....Prof. H. T. French.
Horticulture (including botany).....Prof. U. P. Hedrick.
Entomology.....Prof. A. B. Cordley.
Chemistry.....Prof. G. W. Shaw.
Photography and Engraving.....Prof. E. F. Pernot.
Printing Department.....L. M. Leland.

### PHOTOGRAPHY AND ENGRAVING.

In addition to the work heretofore done, a large amount of excellent and valuable work has been done in the department of Photography and Engraving, by Prof. Pernot. This work has been of so much aid in the publication of the discoveries in Chemistry, Entomology, Botany and Horticulture, Dairying and Agriculture, that I look upon it as one of the most valuable lines of work that we have connected with the station.

PRINTING DEPARTMENT.

The work of Mr. Leland in this department has proven very satisfactory. An examination of the amount of work done shows that he has been faithful to his duties. The amount of printing for the year has been almost double that of the previous year and the expense the same. Attached hereto are detailed reports of each of the above departments.

BULLETINS AND PUBLICATIONS ISSUED DURING THE YEAR.

1st. Dairy Circular.
2d. Flax Bulletin.
3d. Sugar Beet Bulletin.
4th. Prune Bulletin.
5th. Cicuta Bulletin.

In addition to these, we have distributed to the press of the State, six press bulletins containing important discoveries and information. We have also issued for distribution to farmers desiring to experiment in beet culture, instructions for sugar beet growing and blanks for making out reports to the station.

For the coming year we have selected the following lines of work upon which to issue bulletins:

1st. Cheat and Clover—Departments of Agriculture and Chemistry.
2d. Twig Borers—Department of Entomology.
3d. Spraying—Departments of Horticulture and Entomology.
4th. Soils and Water—Department of Chemistry.
5th. Strawberry Pests—Department of Entomology.
6th. Apples and Pears—A comprehensive work by the departments of Horticulture, Chemistry and Entomology.
7th. Preservation of Manures—Department of Agriculture.
8th. Dairy Rations—Departments of Agriculture and Chemistry.

SUGAR BEETS.

Lectures at Portland at the Chamber of Commerce, at Forest Grove before an association of farmers, and at La Grande under the auspices of the Commercial Club of that place, at Elgin, Alicel, Summerville and Union were given by Prof. Shaw.

These lectures were for the purpose of giving special instruction in growing sugar beets. The United States Department of Agriculture provided us with a large amount of sugar beet seed for experiments and this was all carefully distributed over the State accompanied by instructions for growing, and blanks for reports to the station.

The Chamber of Commerce of Portland and an association of merchants at Medford, Oregon, provided considerable sugar beet

seed for distribution, under our supervision, so that we have extensive experiments being carried out in almost every county in the State, from which we will be enabled to formulate a complete list of statistics covering sugar beets in Oregon.

## COLLEGE AND STATION.

### INSTITUTES.

Extended Institutes have been held during the year at Turner, Tangent, Rowland and Hood River. All of these were well attended and intense interest was created along the lines of work discussed.

We tried an experiment of field institutes, in the horticultural interests, that proved very successful.

This plan was to visit orchards during the day and give an illustrated lecture in the evening on the subject of pests of that particular locality. This work was enthusiastically received by orchardists everywhere and the meetings were attended by large and interested audiences.

Our electric stereopticon, under Prof. Pernot's skillful management, was a great aid in giving instruction, and is a most valuable instrument in support of the second elementary purpose of the station, viz., dissemination of useful information.

Institutes of this class and character were held at Ashland, Medford, Grants Pass, Hood River, The Dalles, Pendleton, La Grande and Baker City.

Interesting and valuable work in aid of horticulture by these field institutes was done in the vicinity of Salem under the auspices of the Marion County Horticulture Society. From the success that this class of institutes has met with, I do not hesitate to recommend that they be continued.

Properly organized institutes, I believe to be the very best means of placing the station work in touch with the people, and arousing an interest in the work we are doing. While it is of paramount importance to improve the station in its scientific work, especially along the line of original investigation, it is highly important to place in the minds of the agriculturist and horticulturist the information we already possess. One of the weakest features of our station is the fact that the people of Oregon have not been properly supplied with the knowledge stored up within the station. Other States are overcoming this diffi-

culty by engaging a number of both men and women in continued institute work, and I am firmly convinced that the State of Oregon can do a great and good work by following the example of these other States, and placing in the field institute organizers under the control of the experiment station and supported by the staff of station workers.

I have been able to secure free transportation for all members of the station staff over the railroad lines, and have thereby been able to do much more field work and institute work than has formerly been done, and have expended about $300.00 less for this work than was expended last year.

### STATION ANNUAL INSTITUTES AND COLLEGE FARMERS' COURSE.

A four weeks' institute was carried on at the college, under the control of the station council, covering horticulture and dairying. This was attended by twenty *active* farmers and was a success in point of interest, and its enthusiastic indorsement by those attending is sufficient guarantee of the value of the work to recommend that it be continued. Reduced rates of transportation were secured over the railroad lines to those in attendance. Attached to this report is a complete description of the course of instruction.

### RELATION OF THE COLLEGE AND STATION TO DISTRICT SCHOOLS.

There should be some bond of sympathy or strong relationship existing between this institution and the district schools of the State. The scientific ability of this station should be used in some way to create an interest on the part of the pupils of the district schools, in the problems of rural life.

If the spirit of original investigation or nature study can be inaugurated in the country schools, a great good can be done in the line of investigation as well as in the dissemination of useful knowledge.

The continued requests for information regarding the most common insect pests of the State, such as Wooly and Green Aphis, San Jose Scale, etc., has led me to believe that the introduction of nature study into the country district schools would be a means of rendering most valuable aid to horticulture. Work of this kind must be done by our sceintific men and can be made a branch of institute work and executed by institute workers. Whatever

expense is attached to it should be provided for out of funds coming from the State.

I submit this matter to your consideration, hoping that it will meet with your indorsement. Every prominent educator in the State to whom the plan has been submitted, gives it hearty indorsement.

I have no recommendations to make in the other departments at this time.

Respectfully submitted.

H. B. MILLER,
Director Experiment Station.

## FINANCIAL STATEMENT.

The Agricultural Experiment Station of Oregon in account with the United States, for the year ending June 30, 1897.

DR.

| | |
|---|---|
| To receipts from the Treasurer of the United States as per appropriation for fiscal year ending June 30, 1897, as per Act of Congress approved March 2, 1887 | $15,000 00 |

CR.

| | | |
|---|---|---|
| Salaries | $10,187 54 | |
| Labor | 936 98 | |
| Publications | 657 09 | |
| Postage and stationery | 104 32 | |
| Freight and express | 154 40 | |
| Heat, light, and water | 13 75 | |
| Chemical supplies | 248 91 | |
| Seeds, plants, and sundry supplies | 253 44 | |
| Fertilizers | 28 25 | |
| Feeding stuffs | 154 49 | |
| Library | | |
| Tools, implements, and machinery | 221 00 | |
| Furniture and fixtures | 59 23 | |
| Scientific apparatus | 997 22 | |
| Live stock | 106 80 | |
| Traveling expenses | 663 53 | |
| Contingent expenses | 39 11 | |
| Building and repairs | 174 45 | |
| Total | | $15,000 00 |

# REPORT OF THE AGRICULTURIST.

*President H. B. Miller, Director of the Experiment Station:—*

SIR: Permit me to hand you a report of Station work in the Departments of Agriculture and Dairying for the year ending June 30, 1897.

The work of this department has been conducted chiefly along the lines indicated at the beginning of the year.

## BULLETINS AND PUBLICATIONS.

In conjunction with the department of chemistry Dairy Circular No. 1 was published early in the year. This circular contains 32 pages, and has served as an introduction to future experimental work along this line, as well as that of furnishing much valuable information to the dairymen of the State.

This circular was followed by Bulletin No. 43 on Flax Culture. This publication contains 26 pages and several cuts made by Prof. E. F. Pernot. This bulletin, as well as the dairy circular, has received many favorable comments, and has been much sought after by those who are interested in developing these special industries in the State.

In addition to these publications, I have contributed to four press bulletins and Mr. Kent to one, so that the department has been represented in all of them excepting one.

Many letters of inquiry, upon various farm topics, have been answered during the year. Several of these inquires have been answered by preparing articles for publication in some of the agricultural papers. No extra remuneration has been received for this work. I have simply taken this means of reaching a larger number of people who might be interested in the same thought, or having done so by a request from the publishers of the papers.

The matter of correspondence has greatly increased during the year. As the college and station work becomes better known throughout the State this work will expand. I consider it one of the best ways, although the most arduous, of giving information on the various phases of agriculture which are more or less effected by local conditions.

## INSTITUTE WORK.

As chairman of the Station Committee on Institutes I have organized and taken charge of three institutes during the year.

These meetings were held at Turner, Tangent and Rowland. All of these meetings were pronounced successful and were spoken of as being of great benefit to the communities where they occurred. Mr. Kent presented a paper at two of these meetings on the subject of dairying. I took part in the program at each of the meetings with an address and paper on some agricultural topic.

During the summer vacation I delivered five lectures at the Chatauqua assembly at Oregon City.

### SHORT COURSE.

From January 11th to February 8th, I delivered a lecture each day to a class of thirteen men and women who came to the institution to avail themselves of the benefits derived from the Short Course in Horticulture and Dairying.

While this work did not reach as large a number as we wish it might have done, yet it was well worth the effort, and we believe the work will become more popular in the future. A large number of people engaged in the various industries of the State are beginning to appreciate the advantages offered by the institution in this course of special instruction in the practical affairs of life.

### EXPERIMENTAL WORK.

The experimental work of the department during the past year has been confined very largely to those lines touching the dairy problem. During the winter, extending over a period of four or five months, several experiments were carreed on under the direct supervision of Mr. Kent in testing the effect of various rations on the cost and quality of butter production. Considerable data has been collected which will form the foundation for future publications in this line.

Some two hundred varieties of grasses and forage plants have been placed in plats to determine their adaptability to the climatic and soil conditions which prevail here. The season so far has not been favorable for their development. This work requires much patience and time ere results may be realized.

Ten varieties of flax have been sown in small plats to determine their value for fiber production. A larger area has been sown to test sub-soiling, clover, and potato ground in growing flax for fiber.

One acre of sugar beets has been planted according to directions furnished by the department of chemistry, for the purpose of testing various methods of planting and treatment.

Sixty varieties of potatoes have been planted with a view of further testing their relative value under our soil and climatic conditions. A fertilizer test in the use of potash salts on potatoes is also in progress in this department.

An experiment is being carried on to determine the loss in barn yard manure exposed to the rain as compared with that from manure properly sheltered.

An experiment to determine the method of storing onions has been undertaken. This year we have wrapped a supply in parchment paper and stored in a cool, dry place and shall watch results.

Experiments in testing the effect of elevation in the atmosphere on the souring of milk have been planned and will be carried on this summer.

Experiments in growing barley rye and wheat on a larger and more practical scale are in progress on the college and station farm.

Irrigation versus cultivation is one of the problems which we entered upon in a small way and one which we shall hope to pursue in the future as means and opportunity will permit.

## FUTURE WORK.

Experiments touching the dairy industry we shall pursue vigorously during the coming year. There are many problems in the feeding and care of dairy animals, and in the handling of the dairy product, which we shall hope to enter upon during the coming year. The economy of production in the way of food for stock is one of the important problems upon which we shall attempt to throw some light. The growing of grasses and forage plants is closely connected with the dairy; hence this work we shall follow as closely as possible.

Future work in flax culture will be largely governed by the results reached this season. The experiments now in hand will be completed.

Experiments in studying the effect of tile drainage on adobe land were planned for this year, but were not reached, and will be taken up the coming year.

In addition to the experiments already undertaken there are two lines of work which have not been touched as yet at our sta-

tion. One of them is the sheep industry and the other is poultry. Both of these fields are broad and represent large industries in our State. Experiments in the feeding and crossing of some of the breeds of sheep found in the State I consider a very important line of investigation for the station to take up. Most other stations have done more or less work along this line although the interests in this industry in many of the States are not nearly as extensive as those found in our own State.

If a small sum could be set aside for experiments in feeding sheep it would serve to interest in the Station work a large number of people who do not now have any special interest in its welfare.

Experiments in poultry raising have been discussed and looked forward to, by some of the leading poultry-men of the State. The following clipping was taken from the *Oregon Poultry Journal:*

> We would be pleased to know when our State Agricultural College intends to take up practical poultry raising, and offering a course in this very important farm industry to its students. It does seem strange to us that this very important branch of one of our leading industries should be so long neglected by this institution.

This work would involve an outlay for building, yards, etc., and a suitable person to look after the work.

Cash received during the year from sale of farm produce:

| | |
|---|---|
| Cash paid to Mr. Condon from sale of dairy products | $564 80 |
| Cash paid to Mr. Crawford from sale of dairy products | 26 03 |
| Cash paid to Mr. Condon from sale of farm produce | 381 82 |
| Total | $975 65 |

DAIRY REPORT.

| | |
|---|---|
| Milk received from college farm | 69,267 pounds. |
| Milk purchased from farmers | 12,591 pounds. |
| Butter manufactured | 3,517 pounds. |

Finally, Mr. Director, I wish to acknowledge my appreciation of your hearty coöperation in furthering the interests of the Experiment Station, and in giving the agricultural department efficient and timely assistance in all the work undertaken.

All those who are regular employees in this department have done excellent service during the past year.

Very respectfully,

H. T. FRENCH,
Agriculturist.

## REPORT OF THE CHEMIST.

*President H. B. Miller, Director of Oregon Experiment Station:—*

DEAR SIR: I have the honor to submit the following report of work done in the chemical department of the Experiment Station since July 1, 1896, and to outline the work for the coming year.

The work of the department has been conducted on the same plan as that of former years, except that I have been able, on account of having been allowed a second assistant, to devote a larger share of my attention to station work. A greater amount of analytical work has been done than in any previous years. It has been of such a nature, however, that while the *number* of analyses has not been materially increased, yet the number of operations, measurements and weighings have been increased about a third.

The work of the department has been somewhat handicapped on account of there not having been made a special appropriation to pay certain bills for goods ordered from Germany by direction of the former president to meet the rapidly growing demands of the department. These bills, amounting to something over $400, had to be paid out of the regular appropriation for the department, thus leaving but a limited amount of money for experimental work.

No work has been done for the State Food Commission during the past year.

In accordance with a general plan of work adopted some years since, and again ratified at the beginning of this year, investigations concerning the soils of the State have been pushed as rapidly as other more pressing demands would allow. While the soils which have been examined during the year have been studied with special reference to the prune industry, yet the data secured is of such a nature as to be of general interest and application in all agricultural operations. The results secured from this year's work confirm those secured in previous years. The principal new feature developed is that the lime in the Willamette valley soils is largely the result of the decomposition of zeolites and thus in the form of a silicate—probably a double silicate—which is not likely to be of as much value to agriculture and horticulture as if in the form of a carbonate. Indeed if this is true we

may find that many of the valley soils, even though they may be well drained, may actually be acid (sour) soils and need applications of lime to produce the best results. A few preliminary experiments would indicate this to be the case. This matter will receive close attention during the coming year. The results of previous soil examination have all been re-examined with special reference to the prune industry and the results published in Bulletin No. 45 under the title, "The Fruit Soils of Oregon."

During the early part of the year considerable time was devoted to a study of the composition and food value of Oregon prunes, both evaporated and non-evaporated. On account of the unfavorable season it became necessary to limit the investigations to the Petite prune and otherwise curtail the work. During the previous year, however, a limited amount of work had been done upon Italians and Silvers. Not only was the chemistry of the fruits studied, but a number of experiments were conducted at the drier of Mr. J. R. Shepard, Zena. The data secured from these experiments was not as definite and valuable as could be desired mainly from the fact that the conditions surrounding the experiments could not well be brought under sufficient control. While it was the idea of the writer that this was true to some extent, yet I must confess that the conditions were not nearly as controlable as I had anticipated they would be.

Experiments conducted this year and the conversations I have had with parties engaged in the commercial drying of fruits, serve to convince me that the problem is a difficult one to handle on account of the multitudinous conditions of a constantly varying nature and which are impossible to regulate with any degree of certainty. I am firmly convinced that we must first ascertain by analysis and otherwise what producers are actually placing on the market the best fruit—that having the highest food value—and are securing the largest per cent. of dried product, and thus obtain a number of condition equations from which to work. It is certainly impossible, in the laboratory, on a small scale to successfully imitate the commercial drying, with its fruit in various stages of ripeness and size. Yet there are certain points that must be solved in the laboratory if at all. The matter is such an important one that it will be continued as time will permit.

Experiments to test the efficacy of potash salts as applied to prune orchards have been entered upon. This was planned be-

cause analyses of a large number of soils indicate that the supply of potash in the soils of the Willamette valley is limited, and because of the fact that in a number of cases the fruit has failed to properly fill. It was thought that applications of potash might be of advantage. Muriate of potash for small experimental plats has been distributed to eight of the leading horticulturists of the Willamette valley, who are to make careful observation of the effect of the salt on the general health of the trees thus treated, also weigh and dry the fruit from the fertilized and unfertilized trees separately and forward the fruits for analysis. .

Some time has been devoted to a study of the condition of the common insecticides and fungicides on the market, eighteen samples of Paris Green and London Purple having been analyzed, as well as several samples of copper sulfate. In the case of Paris Green much of it was found to be considerably deficient in arsenic, which fact of adulteration was also true of a number of samples of the copper sulfate.

A considerable amount of miscellaneous work has been done, including analyses of waters, minerals, fertilizers, butter, milk, cattle salt, etc.

A portion of time has been devoted to a study of methods of analysis, particular attention being paid to a comparison of the gravimetric and volumetric method for the determination of phosphoric acid.

The publications of the department for the year are as follows:

The Principles of Cattle Feeding—Dairy Circular.
Do Your Cows Pay Their Board?—Dairy Circular.
A Review of Oregon Sugar Beets—Bulletin No. 44.
The Fruit Soils of Oregon—Bulletin No. 45.
The Composition of Oregon Prunes—Bulletin No. 45.
The Digestibility of Clover and of Cheat Hay—Bulletin No. 47—In press.

In addition to these several lesser articles have been furnished for the monthly Press Bulletin.

The same lines of work are planned for the next year, as well as continued investigations of some phases of the sugar beet problem which have not thus far been determined.

For conducting the work of next year there will be needed about the same amount of money as was estimated for the past year. It will be necessary to add considerable glassware and some platinum ware to our equipment on account of the increased

amount of work dealing with sugar and ash, and this will be needed by September 1st.

While it is not absolutely essential, yet our work would be much facilitated by adding about $200 worth of platinum dishes in addition to that mentioned above, and if possible I hope we may be allowed to purchase them. There is also much needed in the laboratory some apparatus for automatic stirring, shaking, and to furnish power for grinding fodders and other samples for analysis. Some kind of a motor, electric, water, or hot air, ought to be added to our equipment early this season on account of the large amount of beet pulping which will have to be done in September.

The addition of this apparatus is really more essential than that the platinum should be purchased, and I would ask that I be allowed to purchase in the east during the summer a suitable apparatus and forward the same to be put in place before September when it will be greatly needed for pulping beets and grinding samples.

I respectfully submit the above report.

Yours very truly,

G. W. SHAW,
Chemist.

# REPORT OF THE ENTOMOLOGIST.

*President H. B. Miller, Director of the Experiment Station:—*

Sir: The work of this department has been greatly facilitated during the year by the construction of an Insectary. This building, though small and inexpensive, has furnished suitable and much needed quarters for carrying on observations upon the life-histories of injurious insects. By reason of these increased facilities, I have been enabled to obtain more or less complete biological notes on more than ninety species of insects injurious to agriculture in this State. Among these is an apple scale new to the United States; four serious strawberry pests, new or but little known in Oregon; two dangerous prune pests that have hitherto attracted but little attention in this State, and many others of considerable economic importance.

## THE COLLECTION.

In addition to this detailed study of species the insect collection has been enlarged by the addition of at least three hundred species and now contains not less than one thousand species represented by about twenty thousand specimens of Oregon insects, most of which are correctly named and systematically arranged for ready reference. The collection is now sufficiently large to be of considerable value as a means of rapidly identifying the numerous specimens sent by correspondents from various parts of the State.

## INSTITUTE WORK.

Fully three weeks of my time have been occupied in active institute work in addition to the time required to prepare the various papers read, and to prepare material for a large series of lantern slides with which to illustrate them. In addition to the regular institute work papers were also read before the Marion County Horticulture Society and the Yamhill County Horticulture Society. During all of my regular institute work the plan was followed of visiting orchards during the day, and of talking at the evening session on the pests and other conditions that were found to be of local importance. In this way a great deal of interest was awakened and much valuable information gained as well as distributed.

PUBLICATIONS.

Only one bulletin has been published during the year but sufficient material has been accumulated for several others which will be published during the coming year. The one published has been issued as a part of the Prune bulletin and contains a reasonably complete popular account of the insect enemies of the prune. It is believed to represent a decided step forward in our knowledge of this important subject. However, many points still remain unsettled regarding the life-histories of the various pests and the proper remedies to be used against them. It is therefore our purpose to continue our investigations along this line. Besides this bulletin, I have written a number of articles for the agricultural and horticultural press, and have assisted in editing six press bulletins for general distribution to the newspapers of the State. Four of these contained articles from this department.

CORRESPONDENCE.

The correspondence of this department has also continued to increase and now occupies a considerable portion of my time, showing, as I trust, an increased interest in the work of the department throughout the State, and also bringing much valuable information to the station.

INSECTICIDE TESTS.

On assuming charge of this department we were frequently met with the statement that kerosene emulsion can not be safely used upon plants in this climate. Since this is one of our very best insecticides for certain classes of insects, we determined to test thoroughly the truth of the statement. Accordingly experiments have been conducted at various times throughout the year upon a large variety of plants with the result that it has been shown conclusively, as we had supposed, that a properly prepared kerosene emulsion may be as safely used here as in any other part of the country.

The results obtained in the Eastern States in destroying the winter eggs of Aphids and other insects have been almost wholly of a negative nature. However, many prominent fruit-growers of this State are very confident that certain of our winter sprays are very efficient in destroying such eggs, and that in fact they

prove the most successful means of keeping such insects in check. Laboratory tests so far made certainly indicate that here this method is far more practical than is shown by Eastern experiments. Just how efficient they are can not be determined until opportunities offer for more extended experiments.

This spring most of our agricultural and horticultural papers published an article purporting to be from the pen of Dr. R. C. Kedzie of the Michigan experiment station, advocating the use of a preparation of arsenic and sal soda as a cheap substitute for Paris green in spraying operations. Experiments conducted by this department have shown conclusively that in this climate there is great danger of injuring the trees by using this preparation. All of these experiments will be continued, and the details of the work, together with the results obtained, will be set forth more fully in a future Spraying bulletin.

### NATURE OF WORK DONE.

Early last fall it became very evident from observations and correspondence that the peach tree borer was doing a great amount of damage to prunes in the Willamette valley and was fast becoming one of the worst insect pests of that fruit. It was therefore decided to make that insect one of the chief subjects for investigation. An article on this insect in the recent Prune bulletin records what has already been learned regarding it. About twelve hundred trees have been selected in an orchard conveniently located, and experiments are now under way and will be continued for several years, to test the comparative cost and efficiency of the several approved methods of controlling this destructive pest.

This season numerous reports were received regarding the work of a prune twig borer that did much damage throughout the valley from Roseburg to Portland. A careful study of this pest has revealed many new facts in its history that may prove of value in deciding on the proper remedies to use against it. Among other things it has been shown to be entirely distinct from the Strawberry Crown Miner, with which it has hitherto been confused by American entomologists. All the facts regarding the insect that were known at the time of going to press were recorded in an article on the Peach Twig Moth in the Prune bulle-

tin. In order, however, to obtain a knowledge of all its stages it will be necessary to continue observations throughout the year.

These two or three insects are mentioned not as representing all the work done in this line by the Entomologist, but as showing the nature of the work done on each of the numerous species that come under our observation.

### RECOMMENDATIONS.

My correspondence and my observations during the past year have more firmly convinced me than ever before of the value of work in entomology and plant diseases to the agricultural and horticultural interests of this State, and of the great interest that is taken, especially by the horticultural classes in this work. But it has also convinced me that to a certain extent we are not keeping abreast of the demand for information. Original work must be done both in the laboratory and in the field. Field work and laboratory studies must go hand in hand to accomplish the best results. By laboratory work alone can we determine the nature of a given pest, study its development, and suggest probable remedies. By field work and observations alone can the action of the pest be noted under natural conditions and practical tests made of methods of controlling it. Confined as I am to the college by class work, and laboratory observations which can not be neglected, the large amount of field work necessary to give the best results has of necessity been neglected. In a certain sense, I am placed in the position of a physician who is required to treat his patients by correspondence without ever having seen them, and often without ever having seen other patients under similar conditions.

All that is needed to largely obviate this difficulty and greatly increase the efficiency of the department, is the employment of an assistant capable of taking charge of the more elementary class work, and with sufficient knowledge of entomological methods to make the necessary laboratory observations and notes during my absence from college. This would make it possible for me to leave the college for short periods whenever necessary, for the purpose of conducting field experiments, or of investigating the more serious pests under natural conditions.

Respectfully,

A. B. CORDLEY.

# REPORT OF THE BOTANIST AND HORTICULTURIST.

*Hon. H. B. Miller, Director of Oregon Experiment Station:*

SIR: The annual report of the Botanist and Horticulturist of the Oregon Agricultural Experiment Station for the year 1896-97, is herewith respectfully submitted. The lines of work pursued during the past year are indicated somewhat in the order of their importance by the following paragraphs:

## HORTICULTURAL SURVEY OF EASTERN OREGON.

During the months of September and October, 1896, five weeks were spent by the writer in making a survey of the fruit resources of eastern Oregon. The fruit-growing districts visited are as follows: Walla Walla valley, Grand Ronde valley, Eagle valley, and the valleys of the Snake, Powder, Burnt, John Day and Butter Creek rivers. Mr. G. A. Hobbs, Horticultural Commissioner for the Fifth district, assisted in making the survey.

The main object sought was to collect data concerning the resources of the fruit industry in eastern Oregon, and to get a clearer comprehension of the obstacles to the development of that industry; a secondary object was to disseminate knowledge and give instructions regarding various phases of horticulture—fungous and insect pests in particular. The data and statistics collected in accomplishing the first object have been transcribed and are preserved in the office of the department, as a valuable fund of information regarding horticulture in eastern Oregon.

## FUNGOUS DISEASES.

During the year just ending a number of diseases caused by fungi, two in particular, gummosis of drupaceous fruits and the canker of the apple, have been given attention. A full account of the conclusions reached in the study of the gumming of the stone fruits is published in Bulletin No. 45 of this station. It is thought and hoped that the conclusions reached regarding this trouble are final. The main facts concerning apple canker have been ascertained in the season's work, and that the disease can be controlled is a settled fact. There yet remains a verification of

some phases of the life-history of the fungus, after which the publication of a bulletin will be justified.

Late in the season considerable time was spent in studying a curious phenomenon regarding the curling and withering of the leaves of the Italian prune. An account of the trouble is given in the bulletin mentioned above. Some attention was given shot-hole fungus, prune rust, and brown rot, preparatory to describing them in the Prune bulletin, issued this year. In the course of the year's work apple scab and a disease on the pear, the so-called crater blight, have demanded attention.

### SPRAYING.

One of the principal lines of work taken up in this department is that of spraying for fungous diseases. Last spring -1896—the experiments were completely frustrated by the entire failure of the fruit crop. This season—1897—indications are, that the spraying experiments will again amount to but little, because of a partial failure of the fruit crop. In both cases the experiments have been carried through for the benefit to the foliage and because the results indicate in some degree the value of the sprays applied.

### POLLINATION OF FRUITS.

For several years, Mr. Coote, assistant in horticulture, has kept a record of the blooming period of all trees in the station orchards, and noted other facts of interest coming under his observation in regard to pollination. This work will be carried on another year, when a bulletin giving results should be published.

### TESTS OF VEGETABLES AND FRUITS.

The department aims to test all fruits of merit coming before the public. Accordingly, about fifty new varieties have been planted this season. The results from the old orchard last year were meagre along the line of variety testing because of the failure of the fruit crop.

In vegetables a number of novelties were tested in the college garden. Of more value was a test of 60 varieties of Asiatic vegetables grown with the hope of introducing new varieties of merit in our country. The great majority proved worthless, though a few will bear further testing.

### THE NUT ORCHARD.

Attention is called to the fact that a nut orchard of thirty varieties has been set out this season. The nuts are chiefly walnuts.

### BULLETIN WORK.

Two bulletins have been prepared in this department during the year. One, Bulletin No. 45, "Prunes in Oregon," comprises 64 pages; the other, on Cicuta, not yet out of press, comprises about 12 pages. For nature and contents, reference is made to the bulletins themselves.

### PRESS BULLETINS.

Contributions have been made for five Press bulletins, and about that many special articles have been prepared for the horticultural press.

### INSTITUTE WORK.

The writer has given lectures at two institutes, and has addressed three public meetings on subjects relating to his work.

### CORRESPONDENCE.

Every year the correspondence of the department becomes more voluminous. This year, up to date, 300 letters of inquiry have been received and answered.

### WEEDS.

In the early part of the fall of 1896 the matter of the spread of two troublesome weeds, Russian thistle and Tumbling mustard, was given attention. A press bulletin on Tumbling mustard was issued. Both weeds were reported from eastern Oregon. Observations concerning other weeds have been carried on throughout the year.

### A FUNGUS IN BUTTER.

A sample of butter damaged by some low form of plant life was referred to the department for investigation. It proved to be *Stemphylium butyri. n. sp.*, a comparatively rare fungus. Some time was spent in its study. An account of it was published in press Bulletin No. 2.

IDENTIFICATION OF VARIETIES OF FRUIT.

In the fruit season, considerable time is spent in identifying fruits, many of which are new and require time and patience for identification.

CICUTA.

Every spring letters are received asking about plants poisonous to cattle. This spring an investigation of all cases reported has proved that the poisoning has been done by a plant of the Parsnip family, *Cicuta vagans*. Bulletin No. 46 gives an account of the investigations.

The above report is respectfully submitted.

U. P. HEDRICK.

## REPORT OF THE PHOTOGRAPHER AND ENGRAVER.

*President H. B. Miller, Director of Experiment Station:—*

Dear Sir: I herewith submit a report of work done in the department of Photography and Engraving during the year ending June 30, 1897.

Number of engravings made 51.

Illustrations for Short Course circular.

Illustrations for Dairy circular.

Illustrations for Flax bulletin.

Illustrations for Sugar Beet bulletin.

Illustrations for Prune bulletin.

Illustrations for Cicuta bulletin.

Number of lantern slides made 95, comprising Woolly Aphis, Crown Gall, Flat-headed Borer, Bark Borer, Oyster-shell Scale, San Jose Scale, Tent Caterpillars, Fall Web-worm, Climbing Cut Worm, Apple Scab, Peach Leaf Curl, Apple Canker, Peach Leaf Blister Mite, Peach Scab, Brown Rot, Peach Tree Borer, Strawberry Leaf Spots, Strawberry Crown Miner, Strawberry Root Borer, Bud Moth, Twig Borer, Bryobia, and Tetranychus, besides many other slides of apparatus, methods, laboratories, sprays, diseased plants, fungus diseases, etc.

Also all the photographs necessary for record and illustrating, principally micrographs of fruit pests, and diseases of plants.

These lantern slides are used to illustrate lectures at the Farmer's Institutes held each year in different parts of the State, to aid the Agriculturists and Horticulturists in familiarizing themselves with the appearance of these pests.

Any new mite, insect, or fungus should be photographed in its various stages and the photographs filed, with other records relating to the pest. In many cases this can be done only when the most careful and painstaking preparation of the object to be photographed has taken place.

A considerable amount of time was spent in examining samples of milk which were sent to the station. Some of these samples were found to contain spores, and cultures were made from them, producing an alarming amount of bacteria, the nature of which

it was impossible to determine for lack of proper appliances for making a pure culture.

A series of micrographs was made showing the physical change which takes place in cream during the process of churning. The microscope slides were prepared from cream taken at intervals of three minutes each. This experiment clearly demonstrates the necessity of cream being in the proper condition for churning, in order to amass all the fat globules by physical force.

The fact of there being three sizes of fat globules in cream, it is necessary to make known the conditions under which the smaller ones may be amassed to avoid waste of fat in the buttermilk.

A considerable amount of time and study was devoted to a sample of butter, and after discovering the presence of a fungus growth and making photo-micrographs of the fungus it was turned over to the Botanical department for classification.

A series of micrographs was begun this year of the cell walls of different varieties of prunes, to show the exact conditions of the cell walls during the process of drying, and to demonstrate if possible the proper temperature at which the prunes should be dried, in order to simply evaporate the water and still retain all the constituents and flavoring properties.

This one experiment, if properly carried out, will be of immense value to the prune industry, because proper drying determines the commercial value of the product.

Respectfully submitted,

E. F. PERNOT.

# LIST OF BULLETINS

## Published by the Oregon Agricultural Experiment Station to December 31, 1897.

*No. 1, 1888—History and Organization.....Grimm.
*No. 2, 1889—Horticulture.....Lake.
*No. 3, 1889—Entomology and Chemistry.....Washburn.
*No. 4, 1890—Agriculture, Horticulture, Chemistry.....
*No. 5, 1890—Chemistry, Entomology, Zoology.....Irish and Washburn.
No. 6, 1890—Chemistry, Zoology.....Washburn.
No. 7, 1890—Small Fruits and Vegetables.....Coote.
No. 8, 1891—Varieties of Wheat and Flax.....French.
*No. 9, 1891—Silos and Silage.....French.
No. 10, 1891—Entomology.....Washburn.
*No. 11, 1891—Grasses and Potatoes.....French.
*No. 12, 1891—Strawberries.....Coote.
*No. 13, 1891—Chemistry.....Shaw.
*No. 14, 1891—Entomology.....Washburn.
*No. 15, 1892—Horticulture.....Coote.
*No. 16, 1892—Varieties of Wheat.....French.
*No. 17, 1892—Sugar Beets.....Shaw.
*No. 18, 1892—Entomology.....Washburn.
*No. 19, 1892—Oregon Weeds.....Craig.
*No. 20, 1892—Pig Feeding.....French.
*No. 21, 1892—Soils of Oregon.....Shaw
*No. 22, 1893—Horticultural Department.....Coote.
*No. 23, 1893—Sugar Beets in Oregon.....Shaw.
*No. 24, 1893—Potatoes and Roots.....French.
*No. 25, 1893—Codlin Moth, Hop Louse.....Washburn.
*No. 26, 1893—Drainage.....Bloss.
No. 27, 1893—Plant Diseases, etc.....Craig.
No. 28, 1894—Pig Feeding, continued.....French.
No. 29, 1894—Horticulture, Pruning, etc.....Coote.
No. 30, 1894—Potatoes and Roots, continued.....French.
No. 31, 1894—Codlin Moth, Hop Louse.....Washburn.
No. 32, 1894—Five Farmers' Foes.....Craig.
No. 33, 1894—Tent Caterpillar.....Washburn.
No. 34, 1895—Fruits and Vegetables.....Coote.
No. 35, 1895—Pig Feeding, continued.....French.
No. 36, 1895—Composition and Use of Fertilizers.....Shaw.
No. 37, 1895—Experiments in Cattle Feeding.....French.
No. 38, 1895—Fruit Pests.....Washburn.
No. 39, 1895—Grasses, Chemistry.....Shaw.
No. 40, 1896—Prunes, Apples and Pears.....Hedrick.
*No. 41, 1896—Spraying.....Hedrick and Cordley.
No. 42, 1896—Feeding Sheaf Wheat.....French.
No. 43, 1897—Flax Culture.....French.
No. 44, 1897—Oregon Sugar Beets.....Shaw.
No 45, 1897—Prunes in Oregon.....Hedrick, Cordley and Shaw.
No. 46, 1897—Cicuta.....Hedrick.
No. 47, 1897—Cheat and Clover.....Shaw and French.
Circular No. 1—Dairying in Oregon.....Shaw, French and Kent.

Copies will be sent to applicants so long as the supply lasts. Those designated by an asterisk (*) are already exhausted.

Address THOS. M. GATCH,
Director of Experiment Station, Corvallis, Oregon.